

for several generations, but when it comes its conclusions will have to be accepted, for it consists of the actual facts as to the development of life on the globe. The weight assigned by Steinmann to the value of the historic method is not exaggerated, but his methods of using it are open to question.

He advances two main principles, racial immortality and the primary importance of external characters. He emphatically denies the current belief that whole classes of animals and plants have become extinct. He says groups of animals always survive, though we fail to recognise the connection between successive generations. That organic variation should never have followed unsuitable directions and that there are no dead ends in the tree of life is a startling doctrine. This principle of racial immortality leads Prof. Steinmann to conclusions which are not likely to be generally accepted. The trilobites, according to his views, must have lineal descendants, and he finds that various insects are the progeny of different families of trilobites.

Prof. Steinmann's second principle is equally revolutionary. He holds (p. 119) that "for phylogeny the most significant characters are sculpture and form." Engineers have been driven to give torpedoes shapes which resemble those of some sharks, some Mesozoic marine reptiles and whales. This external similarity is usually regarded as an adaptation to the physical necessities of rapid progress through water; but this homoplastic explanation is rejected by Prof. Steinmann. In accordance with his view that form and sculpture are the best guides to relationships, he maintains that the whales are the direct descendants of Mesozoic reptiles. The numerous characters in which the Cetacea agree with mammals and differ from reptiles Prof. Steinmann dismisses as of secondary importance, and as due to a sort of zoological fashion. He maintains that their external resemblances show that the various Cetacea are derived from various groups of reptiles. The Delphinidæ (dolphins and porpoises), according to Steinmann, are the descendants of the Ichthyosaurians, the sperm whales of the Plesiosaurs, and the whalebone whales of such reptiles as *Clidastes* and *Mosasaurus*. Similarly, he derives the Casuarines from *Ceratosauros*, the Patagonian Miocene bird *Phororhacos* from *Belodon*, and the walrus from *Dinoceras*.

Prof. Steinmann's views as to the relationships of various invertebrates and plants are equally startling. The tunicates he represents ingeniously as shell-less descendants of the Rudistidæ, and the characters believed to connect the ascidians with the ancestors of the invertebrates, he says, are of secondary importance, and have been recently acquired.

Prof. Steinmann has done such valuable work both in palæontology and geology that his views are always entitled to careful consideration; but he must not be surprised if the arguments in his present essay are generally dismissed as unconvincing, for they require the re-classification of both animal and vegetable kingdoms on lines which have been almost unanimously rejected by modern biologists.

J. W. G.

OUR BOOK SHELF.

Das Gebiss des Menschen und der Anthropomorphen. Vergleichend-anatomische Untersuchungen. Zugleich ein Beitrag zur menschlichen Stammgeschichte. By Dr. P. Adloff. Pp. 165; 9 text-figures, 27 plates. (Berlin: Julius Springer, 1908.) Price 15 marks.

THIS excellent book is part of the literature of an arduous if somewhat wordy warfare concerning the genealogy of mankind in general and of that variety in particular known as the "Neanderthal" or "Spy" man which broke out some years ago amongst the anatomists along the Rhine valley, and, as this work shows, is still being carried on with great vigour. The outbreak was really a consequence of the discovery of *Pithecanthropus erectus* by Eugène Dubois in 1894. In the light of that discovery, Prof. Schwalbe, of Strassburg, commenced a critical re-examination of the remains of the Neanderthal-Spy race, and came to the conclusion that they could not be regarded as ancestral to modern Europeans owing to their many physical peculiarities, and that they constituted a species of mankind, to which the name *Homo primigenius* was applied.

Prof. Kollmann, of Basel, slighted the specific marks assigned by Schwalbe to *Homo primigenius*, and set out to find the ancestry of modern man in a race of pygmies, with as yet but little success. Then came the discovery of the Krapina men in Croatia by Gorjanović-Kramberger, with teeth belonging to some ten individuals in excellent preservation, and of a type almost unknown among modern men. While the discoverer regarded the Krapina men as mere variants of modern man, Adloff excludes them from the ancestry of modern Europeans, and gives them the specific name of *Homo antiquus*.

The discussions and the disputes have been widened by the Dutch anatomists, Klaatsch (now in Breslau) and Bolk, of Amsterdam, the first of whom upholds the theory that man and anthropoids have sprung independently from a lemuroid stock, while the second maintains that the old-world apes and monkeys are derived from a stock akin to the South American monkeys. It was to clear up the points in dispute that Dr. Adloff produced the work under review; but it is to be feared their settlement is as far off as ever. Dr. Adloff has made a special study of teeth and has taken much pains to obtain access to all available material. He has described and figured all he has seen with accuracy, and thus produced a work which must prove of the greatest value to all who are investigating the problems connected with the origin of man. The facts will stand, but it is to be feared that most of the author's inferences are not of an abiding value. The discussion has scarcely received the attention it deserves in England; the present position of matters may be gleaned from this work.

A. K.

The Hope Reports. Vol. vi. (1906-8). Edited by Prof. E. B. Poulton, F.R.S. (Oxford: Printed for private circulation by H. Hart, 1908.)

THE memoirs contained in the bulky sixth volume of the Hope Reports were published separately in the course of the two years from June, 1906, to June, 1908. They bear eloquent witness to the quantity and quality of work which is being turned out by the Hope Department of Zoology in the University of Oxford. The first ten memoirs are chiefly or wholly concerned with bionomic subjects—e.g. particular cases of mimicry sometimes studied on the spot, the recent developments in the theory of mimicry, experiments on seasonally dimorphic forms, the natural

attitudes of rest in British moths, predaceous insects and their prey. A subject like the last, for instance, worked out by the cooperation of many naturalists, commends itself as zoological work of the soundest sort; it brings together a mass of trustworthy information in regard to insect natural history, it has an obvious bearing on the theory of selection, and it makes towards supplying a trustworthy basis for practical measures. Three of these interesting bionomical memoirs are contributed by Dr. F. A. Dixey, two by the Hope professor, and one each by Messrs. T. R. Bell, A. H. Hamm, S. L. Hinde, W. J. Kaye, and S. A. Neave. Three papers by Dr. Longstaff contain records of observations—chiefly bionomic—on insects met with in various parts of the world. Then follow papers, chiefly of a systematic nature, on Blattidæ by Mr. R. Shelford, on "grasshoppers" by Dr. J. L. Hancock, on beetles by Commander J. J. Walker. After these the volume ends, as it began, with bionomical inquiry, from which modern entomologists are seldom far away. We cannot look over a volume like this (reviving our recollections, in some cases, of papers we had read before) without feeling afresh that the entomologist, more, perhaps, than most naturalists, has his finger on the pulse of evolution. The Hope Reports show that he is not unaware of his great opportunities.

Calcul graphique et nomographie. By M. d'Ocagne. Pp. xxvi+392+xii. (Paris: Octave Dion, 1908.) Price 5 francs.

THE "Encyclopédie scientifique" of which this book forms one volume is intended ultimately to consist of 1000 volumes divided into 40 sections, written by specialists in different sciences, and edited by Dr. Toulouse. While aiming at the completeness of an encyclopædia, it differs from most publications bearing that name in that it consists of small volumes, each treating of one subject, instead of bulky volumes, each containing a number of widely diverse articles.

In this volume M. d'Ocagne deals with graphical methods of computation, a subject in the development of which he has himself played an important part. It is pointed out that such methods are sufficiently accurate for the solution of most problems, financial calculations and certain geodetic operations constituting an exception, though even in these graphic methods may play an important part. The first part of the book deals with graphical algebra and graphic methods of integration, the second with nomography. The latter subject is treated from two points of view, between which a kind of principle of duality exists—the method of concurrent lines, and the method of collinear points. In the former the relation between three variables is determined by the intersection of the lines corresponding to constant values of the respective variables; in the latter three straight or curved lines are scaled, and the simultaneous values of the variables are represented by collinear points on the scales which can be read off by laying a ruler across them. In Prof. d'Ocagne's hands this method has effected quite a revolution in simplifying numerical approximations, and it has the merit of being easily extended to more than three variables.

Mythenbildung und Erkenntnis. By G. F. Lipps. Pp. viii+312. (Leipzig: B. G. Teubner, 1907.) Price 5 marks.

This is an interesting contribution to the literature which in recent times has been filling up the gap between mathematics and philosophy. In it the author traces the origin of mythical superstitions in primitive races and their subsequent replacement by the critical methods of exact analysis. He further discusses the

application of symbolic methods to the representation of phenomena connected with the universe, with existence, and with thought. The book forms a suitable sequel to Poincaré's "Science and Hypothesis," and is published in the form of the third of a series of books bearing the title of Poincaré's volume. While covering a somewhat different field, Dr. Lipps's method of treatment is more constructive in character. He has attempted to build up a connected theory rather than to ask the invariable question, Why?

The Old Yellow Book. By Charles W. Hadell. Pp. viii+cclxii+345. (Washington: Carnegie Institution, 1908.)

THE first part of this large volume consists of a complete photographic reproduction of the "Yellow Book," now in the library of Balliol College, which formed the theme of Browning's poem, "The Ring and the Book." This is followed by an English translation, as well as translations of two other sources of information relating to the Franceschini murder case, and an essay by the author on "The Making of a Great Poem." The photographic reproductions, as the author points out, are of first importance to secure the scholarly world against the possible destruction of the unique copy in Balliol College. At the same time, seeing that a few blemishes, due to creases in the original book, have been removed, and that the pages have been re-numbered, it seems a pity that the present book was not properly guillotined before being issued to the public.

LETTERS TO THE EDITOR.

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On the Magnetic Action of Sun-spots.

It was perhaps to be expected that the recent discovery of the Zeeman effect in the spectra of sun-spots should revive the idea of a direct magnetic action originating in the sun and observable at the surface of the earth. A numerical estimate is therefore called for as to the magnitude of the disturbance which might be produced by such a direct action.

A solar vortex involving electric circulation, and consequently magnetic fields, will be most favourably placed to produce magnetic action if its apparent position is at the centre of the solar disc. If we consider the disturbed area, which for convenience I shall call the spot, as a magnetic pole, the first question that arises refers to the whereabouts of the opposite pole. We may place it at the further end of the solar diameter passing through the spot, and thus again assume the most favourable conditions. If, now, the vertical forces on the solar surface are treated as made up of a series of spherical harmonics, we need only consider the first term from which forces varying inversely as the cube of the distance are derived, because the numerical values of the forces derived from the higher terms are, at the distance of the earth, at least a hundred times weaker. Write, therefore, for the vertical force F

$$F = B\mu + \text{higher terms,}$$

where μ is the cosine of the solar co-latitude measured from the spot.

The coefficient B is determined in the usual way by

$$\int_{-1}^{+1} F\mu d\mu = \frac{2}{3}B.$$

As the spot is confined to a small region, for which $\mu = 1$, and F has only finite values over this region and at the opposite pole, we may for the left-hand side of the